Attachment A

SCC White Papers

9-1-1 SafetyNet CLEC

9-1-1 SafetyNet Telematics

9-1-1 SafetyNet

9-1-1 SafetyNet Wireless

OSS Gateway Advantage

9-1-1 SafetyNet℠—Telematics

The Next-Generation Public Safety Communications Network

August 2, 2000

SCC

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Executive Summary

Telematics devices, also known as "mayday" devices, combine electronic sensors in automobiles with wireless communications devices equipped with location-determination capabilities and connect to a call center. These devices provide users with a new level of traveling convenience and safety with a variety of features, such as emergency roadside assistance, stolen vehicle tracking, navigation assistance, concierge services, and Automatic Crash Notification (ACN).

The service behind telematics equipment is quite amazing. Today, for an average price of ten dollars a month, a subscriber can be instantly connected by wireless technology with the telematics service provider's call center. Once connected, the subscriber can obtain concierge services—such as hotel or restaurant reservations, driving directions, order a tow truck or service vehicle, and with some systems, even have the doors unlocked remotely.

In 1998, General Motors (GM), Ford, Mercedes, and other automobile manufacturers began installing telematics devices in a limited number of their models. Since that time, the number of vehicles manufactured with telematics devices as standard or optional equipment has grown considerably. GM, for example, will feature the devices on approximately 2.5 million cars and light trucks in the 2000 model year. After-market sales of telematics equipment is also expected to create new market opportunities in 2002 as new vehicles offer plug-and-play telematics technology as standard equipment. This will make installing telematics communications systems as easy as installing a car stereo system. As a result, industry analysts estimate that the total number of vehicles with telematics devices will exceed 50 million by 2004.[1]

Telematics systems incorporate a number of technologies, and the industry has assembled a diverse group of participants—including automobile manufacturers, automotive component manufacturers, wireless telecommunications carriers, wireless location determination companies, and insurance companies—to collaborate in bringing telematics services to subscribers.

Emergency Assistance

Telematics devices and service providers also provide an important public safety service. Subscribers can contact the telematics service's call center and report an emergency. For example, a telematics subscriber can contact the call center to report a drunk driver. The call center, in turn, conferences the caller with a 9-1-1 Public Safety Answering Point (PSAP).

In the event of an accident involving a telematics-equipped car, the devices themselves can trigger an emergency call into the telematics service provider's call centers. Several sensors located in the vehicle, such as the airbags, automatically send data to the telematics provider. Along with the deployment data, the location of the vehicle is identified using Global Positioning Satellite (GPS) data. The call center uses the GPS data to contact the nearest emergency respondents.

[1] The Strategis Group. U.S. Telematics Marketplace 1999. October 1999.

Some telematics devices can send detailed accident information. Using sophisticated databases and information from crash tests, telematics sensors are able to collect and transmit a multitude of information concerning what happened before, during, and after the crash. Information such as speed at impact, extent of damage to the vehicle, number of occupants and their movement during the crash can be made available to emergency responders.

Making the most of the emergency data during a crisis is crucial—to those in need and to the success of the telematics industry. To date, bringing the same level of 9-1-1 service to telematics has been a challenge. 9-1-1, as we know it, is a thirty-year-old system that was designed to support calls from fixed locations. Merging new, high-speed technologies with traditional 9-1-1 has made emergency response a costly and problem-ridden venture for many telematics companies.

SCC Communications Corp., in collaboration with other leading-edge communications companies, has embarked on an exciting opportunity to develop and deploy 9-1-1 SafetyNet[SM]—the next generation of emergency communications. 9-1-1 SafetyNet is designed to accommodate traditional and non-traditional emergency calls, which originate from a wide variety of platforms, access networks, and service providers. 9-1-1 SafetyNet will introduce modern technology into a less-than-modern network.

Current Telematics Emergency Call Flow

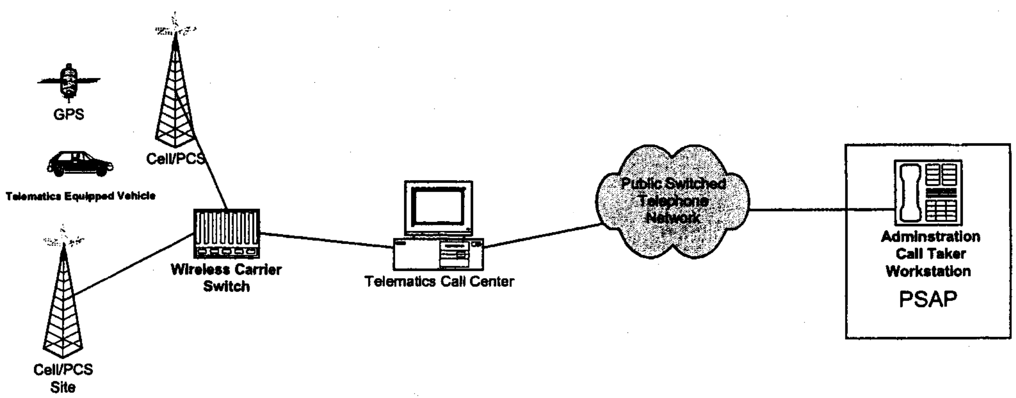

Figure 1: Typical Telematics Emergency Communications Schematic

Telematics devices are able to communicate emergency situations two ways—manual calls and with ACN. The call flow of each of these is discussed in detail below.

Manual Calls for Emergency Help

A button-activated wireless speakerphone activates most telematics devices. The speakerphone is programmed to call the telematics service provider's call center. Upon answering, the vehicle's GPS coordinates are delivered to the call center's operator and depending upon the call center, these coordinates might be displayed on an electronic map.

Most telematics service providers maintain telephone numbers for emergency response agencies—PSAPs, police, fire, and emergency medical service—around the country. When an emergency situation arises, the call center operator looks up the telephone number of the closest emergency response agency. The operator conferences the emergency call with the public safety response agency using the Public Switched Telephone Network (PSTN). The call center operator usually stays connected for the duration of the call—offering assistance to both the subscriber and the public safety response agency.

Using this model, the delivery of telematics calls to PSAPs has presented numerous challenges. Simply put, calls from telematics service providers are not delivered through the 9-1-1 network in the same manner that other emergency calls are. Rather, telematics calls are delivered to PSAPs via ten-digit administrative lines because they cannot route the call through the 9-1-1 infrastructure. Administrative lines traditionally handle non-emergency calls, and calls routed to those lines receive a lower priority than 9-1-1 calls.

ACN Calls for Emergency Help

Automatic Crash Notification (ACN) calls are handled in a similar manner to manual calls, with the exception that an ACN call is data only. ACN calls are initiated from commands by one or more sensors on the vehicle. For instance, the deployment of an airbag will prompt a telematics device to send an emergency data call. The telematics device's wireless communications equipment on the car initiates the cellular-packet data call to the telematics service provider's call center. The initial set of data includes the GPS location coordinates of the vehicle and the contact telephone number for the vehicle.

Subsequent data packets originating from the car deliver information about what happened before, during, and after the incident that prompted the call. Speed at the time of the incident, direction of travel, impact area on the vehicle, airbags deployed, number and location of the occupants, and whether or not seat belts were in use are just some of the data elements generated by telematics devices.

Once all of the data is delivered to the telematics service provider's call center, the operator must assess the data and determine whether emergency officials need to be contacted. The operator will attempt to contact the occupants of the call to gain first-hand knowledge of the incident and any possible human injury. Once the decision has been made to contact emergency authorities, similar procedures as those for manual calls are implemented. The call center operator will use the GPS data to determine the nearest response agency, then access the telephone number from the call center's listing of emergency contact telephone numbers. The call is then placed to the emergency response agency. Telematics operators relay, by voice description, the data received from the on-vehicle sensors. Today, PSAPs and emergency professionals do not have the technology to receive telematics data, nor can the 9-1-1 system support large data streams generated by telematics; therefore, all ACN data must be provided by voice description.

Telematics' Impact on Public Safety

The 9-1-1 emergency communications system in the United States has performed well for over thirty years. Enhanced 9-1-1 (E9-1-1) systems are able to identify the location of the calling party and deliver this information to the PSAP. This is true for people calling on wireline telephones, and quickly becoming a standard for wireless calls as well. While E9-1-1 continues to give traditional devices prompt emergency response, telematics calls represent a technological challenge to most PSAPs.

Emergency Calls Sent as Non-Emergency

Public safety officials are concerned that telematics calls are not delivered through the 9-1-1 network. Instead, they are passed through the PSTN to administrative lines at the PSAP.

To further acerbate the problem, since these calls are not delivered over 9-1-1 trunks—trunks specially engineered to deliver the telephone number of the calling party—PSAPs do not receive the same mount of data that they are accustomed to having with wireline emergency calls. Typical 9-1-1 calls include the telephone number of the caller which is used to query the Automatic Location Database (ALI) for information that details the address of the caller and identifies which emergency respondents are to be sent. This streamlines the delivery of emergency services. Delivery of this data can reduce the amount of response time by as much as four minutes[2] on the typical 9-1-1 call.

Undeliverable Data

The problem for most PSAPs is the inability to receive GPS data coordinates and make them useful for the delivery of emergency services. Most PSAP agencies do not have the data circuits or technology required to receive this type or amount of information.

The data generated by telematics devices can be a very useful tool in dispatching properly equipped responders. For example, if the public safety responder knows that the car has rolled several times and the damage to the vehicle is significant enough to render the doors useless, emergency officials equipped with jaws-of-life can be sent to the scene. Assessment of the data from telematics sensors can help emergency officials determine early on in the incident whether special response is required.

Database Accuracy

Perhaps the biggest impact telematics devices have on public safety, particularly the PSAP, is how a PSAP is chosen by the telematics services call center. As previously discussed, call centers usually use a self-made directory of public safety response agencies around the country. They may bypass the PSAP altogether, opting instead to conference the caller directly with the responder. This deviation from procedure is looked upon with disdain in most PSAPs. In many areas of the country, calling directly into the respondents is discouraged; however, local legislation and common sense dictates that the calls be handled appropriately by whomever answers.

[2] Report published by the National Emergency Number Association, 1992.

Accuracy of the directory of emergency responders is sometimes questionable, plus a maintenance nightmare for the telematics service provider. Some call centers spend a great deal of time calling public safety officials around the nation to identify and verify emergency contact telephone numbers.

In addition to the accuracy of the contact telephone numbers, the service boundaries of the emergency responders need to be considered. The telematics service call center operator identifies the location of the caller—either manual or ACN—using the GPS coordinates sent by the telematics device. This information is then used to identify where, geographically, the caller is located. Once the location is known, the closest *known* emergency respondent is contacted. This is regardless of what city or country boundaries or interoperational agreements exist.

9-1-1 SafetyNet

9-1-1 SafetyNet is a single purpose network designed to function with the highest level of performance, reliability, and availability. It is comprised of two distinct layers: the Emergency Communications Network (ECN) and the Coordinate Routing Database (CRDB), which supports the ECN.

9-1-1 SafetyNet's network is an addition to the existing E9-1-1 network infrastructure that is in place all across America today. This is an important benefit to the public safety community as very little change, if any, is required to take delivery of 9-1-1 SafetyNet calls.

This system was demonstrated on June 1, 2000, with the assistance of Veridian, a manufacturer of telematics devices, and the Harris County, Texas Fire Department Dispatch Center. During the demonstration, 9-1-1 SafetyNet received ACN calls generated from a wrecked vehicle and presented the ACN call to the Houston Fire Department Dispatch Center as a native 9-1-1 call complete with ALI information. The test was highly successful.

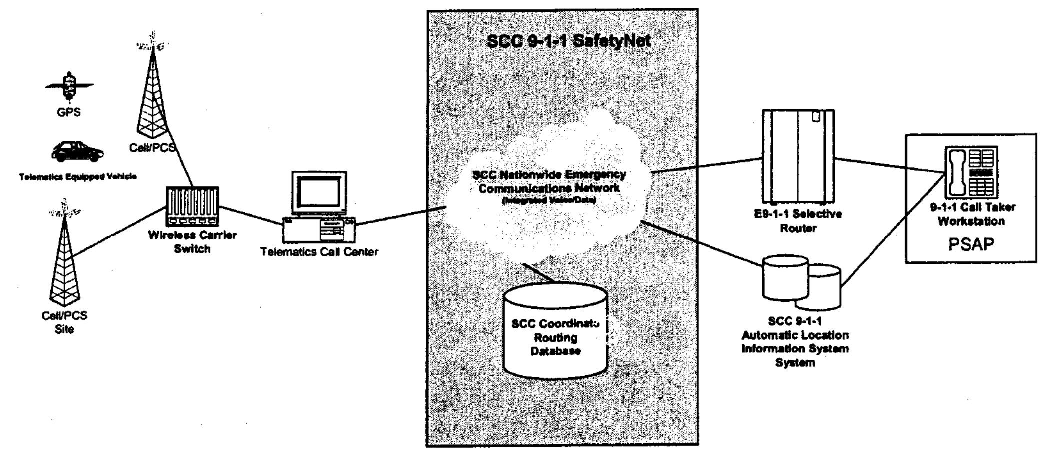

Figure 2: 9-1-1 SafetyNet Schematic

Emergency Communications Network

SCC is deploying a redundant voice and data network that will take emergency calls generated from telematics devices and route the call through the 9-1-1 selective router to the PSAP. The PSAP will receive the same information that a wireline 9-1-1 call presents, including Automatic Number Identification (ANI) and ALI records.

Strategically placed communications gateways to the network will be deployed by SCC throughout the United States. These communications gateways will provide access into the private, virtual network, and provide delivery of the call to the selective router. The local Telephone Company operating the selective router will then present the call to the PSAP.

SCC's ECN is comprised of virtual, private circuits between gateways. This advanced technology ensures the reliability of the network. Instead of using dedicated lines between gateways or lines that can be damaged, SCC's virtual circuits ensure multiple paths between gateways. This means that a 9-1-1 call has several potential routes to get from the caller to the selective router. The network selects a route at the time the call is made. If for some reason the chosen route is suddenly unavailable, the network automatically selects another route. This technology is redundant and self-healing, making it more reliable than dedicated network architectures.

The other advantage to SCC's ECN is that no matter what type of device made the 9-1-1 call—whether it be a wireless call, a call originating from an Internet Protocol (IP) phone, or a manual or ACN telematics call—it is delivered to the PSAP as a native 9-1-1 call. The PSAP needs no special equipment or procedures to handle the call.

Coordinate Routing Database

The CRDB is a collection of digital maps of the United States, sufficiently detailed to identify every known street and road. Using sophisticated computer-generated GIS tools, SCC can identify and map the boundaries of every PSAP in the country. These polygons identify the shape of the PSAP service boundary and are used to route the 9-1-1 call to the appropriate PSAP. The longitude and latitude identifying the location of the 9-1-1 caller is placed on the digital map within a PSAP polygon, thus identifying the correct place to route the call.

An example of the CRDB in action could be: a motorist looses control of the car and strikes the guardrail in central Missouri, miles from the nearest town. Fortunately, no one is seriously hurt, but the position of the wrecked vehicle poses a significant safety threat to other vehicles. The driver initiates a manual telematics call. The telematics service provider's call center, recognizing the need for emergency response, passes the call into SCC's 9-1-1 SafetyNet. The equipment in SCC's network uses GPS coordinates of the vehicle to identify its specific location in the CRDB. This location is then matched to the PSAP having jurisdiction. SCC's network then passes the call to the selective router providing signaling instruction to the identified PSAP. The call is delivered to the PSAP as a native 9-1-1 call. When the PSAP does a query of the 9-1-1 database, a record of the call, including the location of the caller and a call back telephone number is received. Appropriate response authorities for law enforcement, fire, and emergency medical are identified just like any other E9-1-1 call. All this is performed in a matter of seconds.

Dynamic Automatic Location Identification Update

The Federal Communications Commission (FCC)-mandated Phase I and Phase II wireless 9-1-1 initiative states that 9-1-1 calls made from wireless phones—including telematics devices—must provide the location of the calling party and a call back telephone number. This is accomplished by generating an ALI record of the calling party at the time the 9-1-1 call is made. This dynamic ALI record is then delivered to the PSAP when the ALI query is made.

To accomplish dynamic ALI updating on a telematics call, SCC's ECN attaches an Emergency Services Routing Key (ESRK) to the call. An ESRK is assigned to each PSAP by the CRDB. This unique telephone number is presented to the 9-1-1 selective router as an ANI. The 9-1-1 selective router uses the ESRK to identify the appropriate PSAP. The 9-1-1 selective router then sends the ESRK as ANI to the PSAP in front of the 9-1-1 call. Upon receipt of the ESRK at the PSAP the ANI/ALI controller, a special piece of equipment at the PSAP, queries the ALI database using the ESRK ANI.

At the same time the ECN is delivering the call to the 9-1-1 selective router, SCC's database management systems automatically create a dynamic ALI record and place it into the ALI database. This ALI record includes the address of the telematics caller, either GPS latitude and longitude coordinate or closest known street address, and the callback number of the telematics device. This record is delivered to the PSAP when the ALI query is made.

Summary

Over the next five years, as many as 50 million automobiles and trucks will be driving the streets and highways of the United States equipped with telematics devices.[3] Each of these fifty million devices represents a challenge to the existing 9-1-1 telecommunications infrastructure. To mitigate the impact of telematics generated emergency calls, calls must be presented to public safety in a manner similar to other 9-1-1 calls.

Because of the interoperability of SCC's ECN, CRDB, and the dynamic ALI update, telematics calls are delivered to the PSAP looking just like any other 9-1-1 call. Normal call handing procedures for disposition of the call and delivery of appropriate emergency response are possible.

Capabilities and Experience

SCC is the largest provider of outsourced 9-1-1 database services in the United States. We currently provide services to approximately 90 million wireline subscribers and are under contract to provide services to wireless carriers with a subscriber base in excess of 30 million records.

[3] "US Telematics Marketplace: 1999" ©The Strategis Group, October 1999

Our customers—Incumbent Local Exchange Carriers (ILECs), Competitive Local Exchange Carriers (CLECs), and Wireless Carriers—can outsource their 9-1-1 management requirements to us, saving them time and money and allowing them to focus on their core business. Access to these databases is facilitated by a highly reliable, fully redundant data network that is monitored around the clock from our Network Operations Center in Boulder, Colorado. In addition to the telephony sector, we are the designated provider of E9-1-1 database management services for the state of Texas, handling both wireline and wireless services statewide. This represents a new level of service with fair and equal access for all carriers.

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